

Innovation for Sustainable Development

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Innovation in agriculture: fields of alliances and controversies

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In agriculture as in other sectors, innovation has become a standard concept that mobilizes a wide range of actors. Innovation is seen as a key that could unlock the door to an economically, environmentally and socially sustainable form of agriculture. For the various mobilized actors and the institutions that represent them, it is also however a tool that enables them to envisage their own future, to legitimize and sustain themselves. Thus, if we believe the pronouncements, the agriculture of tomorrow cannot happen without agronomic research institutions and their academic forces; and neither can it happen without the support of the agricultural development services present in rural areas at the interface with farmers. The capacity of these institutions to innovate and to develop new technical systems is claimed to represent the seeds of future agriculture, and the same is true for the upstream industries that would be called on to play a central role in the development of more environmentally friendly inputs, overcoming the scarcity of natural resources and enabling the coming global food challenge to be met. Ultimately, at a time when it is such a hot topic, it is as if innovation has taken on the meaning of carrying on with the same actors, so that they all continue to exist, with the proviso that things will be done (slightly) differently. There are very few actors, or perhaps even none, for whom real innovation is an objective that would make themselves obsolete. This perspective not only opposes innovation in its etymological sense of introducing something *new*, but the refusal to change, to strive to keep things the way they are, could be regarded as provocation, or at least as a very bad strategy.

Yet beneath the unisonous discourse, a thorough

examination of the dynamics around technical innovation reveals more complex trajectories, critical positions and controversies. Innovations in the fields of production and agricultural practices are thereby instructive because they enable the friction between the different categories of aforementioned actors, who are however united in their need to innovate, to be taken into consideration. But beyond this, a deeper analysis of these categories enables us to question their unity, which de facto examines the displayed consensus on innovation. Indeed, innovation is not only about uniting, associating, linking and creating synergies: very often, as emphasized by Schumpeter (1911), it also involves destroying, dividing and criticizing.

Critical activity and tensions between farmers and agronomic research

Crop and animal production systems have provided many examples of technological innovations that have shaken up the agricultural world and its ever-growing intersections with a society that is eager to re-appropriate agricultural, food and rural issues. The debate is usually organized around a critique of the impact of technology on the environment, consumer health or even on the future of rural areas. Genetically modified organisms have probably represented, and still do today, the richest example in terms of twists and turns and controversies, causing mobilizations in favour of more controlled experiments (De RAYMOND, 2010) and a strong polarization within the scientific community (BONNEUIL, 2006).

However, other innovations have recently hit the headlines that have triggered, in particular, the mobilization of farmers around the definition of technical models for

sustainable agriculture. This mobilization has been based on, notably, a strong criticism of research and development institutions, denouncing the capability of their work, conducted in laboratories and research centres, to consider, assess or valorize innovations made by farmers on farms. The dynamics concerning crop breeding on the farm (DEMEULENAERE and BONNEUIL, 2011), grassland livestock systems (HASSANEIN, 1999) or the techniques of no-till/direct seeding¹ have been instructive on this matter. The latter case, in which area the author has a particular involvement (GOULET, 2008), indeed enables us to gain a better understanding of the tensions and frustrations, but also the alliances, that have developed in the early 2000s between 'conventional' farmers and agricultural research. Since the mid-2000s, this area has also witnessed the development of a list of arguments around the desired and desirable agricultural models, amid the environmental crisis inherited from the productivist model and the recent return of world hunger, which has been raised as a global public health problem.

Agricultural research and its relation to the 'real world'

The development of direct seeding techniques in France from the late 1990s has followed a path of user-developed bottom-up innovations (AKRICH, 1998; VON HIPPEL, 2005): groups of farmers, supported mostly by agricultural supply companies selling farm machinery (including direct seeding drills), fertilizers and herbicides, have developed cropping systems based on no-tillage and cover crops. This innovation can be classified as bottom-up because most of its development has taken place at the margins of the 'official' institutions of agricultural research and development, which for the French arable sector include: the National Institute for Agricultural Research (INRA), Arvalis and the French Chambers of Agriculture. Some groups, however, have received direct support from scientific actors at the 'periphery' of French agronomic research, such as: agronomists from the Centre for International Cooperation in

Agronomic Research for Development (CIRAD) with experience in the development of these systems in the tropics, and from former INRA microbiologists. The pioneer groups used the work of these actors as the basis for their defence of the environmental record of no-till, particularly in terms of the physical and biological benefits to soil quality, at a time when the agricultural profession was under intense criticism for its environmental impact.

In the early 2000s, given the limited amount of available knowledge on these techniques, French research and development institutions implemented cropping trials at agricultural experiment stations to measure their agronomic and environmental effects. The objective was to take stock of this innovation during a period when it was becoming increasingly popular with growers, some of whom had turned out to be real advocates of no-till and gathered within associations such as the National Foundation for Agriculture Soil Conservation (FNACS) and the Breton Biodiversity, Agriculture, Soil and Environmental (BASE) group. A lively debate then broke out between these organizations and the research and development institutions when the latter published measurements of the effects of no-till in terms of carbon storage, erosion and soil quality. The trial results showed that the benefits were far below those expected by the promoters of no-till, especially those measured in South America and France by the aforementioned scientists. The critical reaction was particularly targeted against the nature of the tests conducted at the experiment stations and the methods employed. Detractors claimed that the cropping systems evaluated by the French institutions were unrepresentative of the reality of no-till as practiced by farmers in France and elsewhere in the world: the trial plots were subject to shallow soil tillage, the crop rotation used meant that the soil was left bare in winter and the plots did not have a sufficient number of years of no-till. In short, no-till proponents argued that research conducted at public institutions was unrepresentative of real-life direct seeding systems, and the controversy centred on the ability, or inability, of agricultural experiment stations and laboratories to accurately represent reality. Supported by their scientific allies, no-till advocates and practitioners then responded in the form of their own experimentation: based

1. Cultivation techniques used in cereal production that avoid disturbing the soil through tillage and that depend instead on the use of non-selective herbicides such as glyphosate.

FIGURE 1 The expansion of no-till farming, a network issue

Exchanges between researchers from Brazil, Argentina and France have initiated a network for the expansion of the no-till farming technique throughout the world.

on measurements carried out in the fields of pioneer farmers. The results obtained, which were far more in favour of no-till than those issued by the research and development institutions, gave credence to the idea that laboratories and research stations do not provide accurate representations of the real world, in this case that of farmers and their farms.

This criticism of experimental science does not, however, only stem from farmers who feel neglected by agricultural research and who seek recognition for their own work on the development of innovative technical systems. It also comes from those in the academic world, or its periphery, who are associated with farmers. Whether these are the voices of CIRAD researchers, former INRA employees or retired academics, they all express disappointment that their engagement with farmers in relation to agronomic research is no longer at the service of farmers, but that they have become confined to laboratories and working with computer models, which has resulted in a lack of

attention on the clinical practice of agronomy and soil sciences for real-world development. It is the controversies surrounding the environmental assessment of no-till, more so than the mere friction that exists between lay people and research and development institutions, that have enabled the various tensions to be taken into account, including those within agronomic sciences itself and those derived from the way research is practiced, its objectives and the relationships that it must maintain with the farming community and society as a whole.

Arguing, qualifying and disqualifying: innovation and the polarization of actors

Such controversies therefore provide insights into the tensions that cross the social spaces of dedicated professional groups, but also into the ways in which, during the moments of displacement and uncertainty associated with innovation processes, the arguments are constructed in the defence of one practice out of a group of several possible

ones. Returning to the example of no-till, we can indeed see that the actors involved use two distinct methods to defend their positions. The first is to argue in a very positive way for the benefits offered by these practices, particularly through the previously mentioned experiments. The second method, which is even more important because it is a central area of rhetoric that is ultimately little explored, consists of the development of an implied argument that disqualifies the ability of competing or opposing models to address the challenges of society. Thus, for example, advocates of no-till cast doubt, despite recognizing certain assets, on the ability of organic farming to meet what they consider to be priority issues, such as soil conservation in particular, because organic farming prohibits the use of synthetic herbicides and therefore relies on the frequent working of soil for weed control. They also question the ability of organic farming to maintain high production levels and thus to 'feed the world', an issue that has been particularly prominent since the early 2000s as world food security has (once again) become a key issue (MAYE and KIRWAN, 2012) within the discourses of agricultural research, politics and some sections of the French agricultural profession (GOULET, 2012). In return the supporters of organic farming have tended to criticize the systematic use of herbicides in no-till and the contribution of the technique to the extension of latifundia worldwide, an agricultural system which for the last twenty years or so has been facilitating the concentration of land in South America for intensive soybean cultivation involving a reduced number of producers and businesses (BERTRAND, 2004).

Thus, these controversies are more than simply a debate about the intrinsic value of innovation, they encompass the criteria for the definition of a good farmer and his or her ability to address the mandate set by society as defined by the sociology of professions (BUCHER and STRAUSS, 1961); more generally, they also include the contours of agricultural development models that are considered fair and useful for farmers and society as a whole. Controversies, and the innovations that cause them, thus take shape and evolve with the process of attachment and detachment (GOULET, VINCK, 2012), defining the desirable forms - and non-desirable ones - of agricultural activity. Actors define their activities, practices, identities and affiliations

in terms of what they are, but especially in terms of what they are not and what they do not or no longer want to be. For example, the no-till practitioner no longer wants to be considered as a farmer who degrades soils, while organic farmers do not want to be associated with pesticides that are detrimental to the environment, their health and the health of consumers. This list of arguments is also shared by the above mentioned actors of research who, as we have seen, ground their assertions by distancing themselves from colleagues who they consider to be dependent on mathematical models, publication requirements and, more broadly, who are cut off from reality and the problems of farmers. The importance of these detachments should therefore be considered in the innovation process and in the regimes of controversy, because the definitions of good ways of doing things are often formed by the qualification and problematization of the bad ways of doing things.

Technical innovations and the controversies they generate lead to a consideration of the tensions that develop between the different categories of actors in the agricultural worlds, and also within these categories. While innovation is a motto behind which a large range of actors can stand together, on a discursive level at least, the examination of the practical mechanisms through which it takes shape instead invites us to consider the debates and deconstructions that accompany innovation. It is therefore a subject of interest for the social sciences in their work on understanding the forms of organization of the social world and their transformations.

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